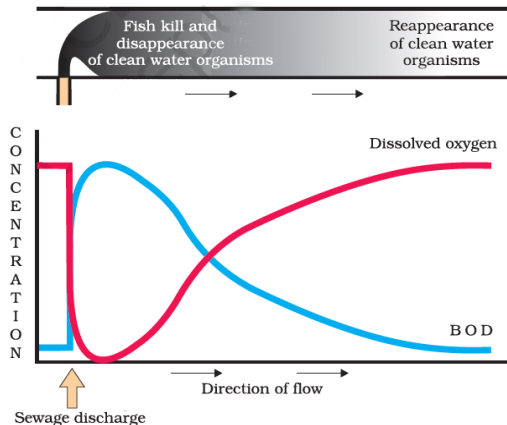


16. ENVIRONMENTAL ISSUES

WATER POLLUTION AND ITS CONTROL

Domestic Sewage and Industrial Effluents

- Domestic sewage contains biodegradable organic matter. It is decomposed by microorganisms.
- Amount of biodegradable organic matter in sewage water is measured as **Biochemical Oxygen Demand (BOD)**.
- During biodegradation, microbes consume O₂. It results in a sharp decline in dissolved O₂. This causes death of aquatic organisms.



Effect of sewage discharge on some important characteristics of a river

- Presence of more nutrients in water causes excess growth of planktonic algae (**algal bloom**). It imparts a distinct colour to the water bodies and deteriorates the water quality resulting in death of fishes. Some bloom-forming algae are extremely toxic to human beings and animals.
- **Water hyacinth (*Eichhornia crassipes*)** is the most problematic aquatic weed ('**Terror of Bengal**'). They grow abundantly in eutrophic water bodies.

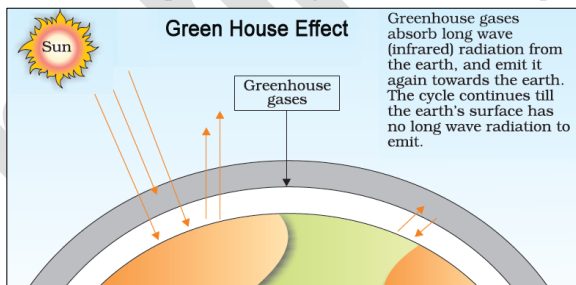
- Sewage from homes & hospitals contain pathogens that cause dysentery, typhoid, jaundice, cholera, etc.
- Industrial waste water contains toxic substances like DDT, heavy metals (mercury, cadmium, copper, lead, etc.) and organic compounds.

Eutrophication

- It is the natural aging of a lake by nutrient enrichment.
- In a young lake, water is cold and clear supporting little life. With time, streams draining into the lake introduce nutrients (N₂, P etc.). It increases lake's fertility.
- Thus plants & animals grow rapidly, and organic remains are deposited on the lake bottom. So, the lake grows shallower and warmer, with warm-water organisms.
- Marsh plants take root in the shallows and fill in the original lake basin. Eventually, the lake becomes land.
- Depending on climate, size of the lake and other factors, the eutrophication may span thousands of years. However, pollutants like effluents from industries and homes accelerate eutrophication. This phenomenon is called **Cultural or Accelerated Eutrophication**.
- The prime contaminants are **nitrates & phosphates**. They overstimulate the growth of algae. It causes unsightly scum and unpleasant odors, and robs the water of dissolved oxygen. It leads to death of other organisms.
- **Heated (thermal) wastewater** from electricity-generating units (e.g. thermal power plants) eliminates organisms sensitive to high temperature. It may enhance the growth of plants and fish in extremely cold areas but, only after causing damage to the indigenous flora and fauna.

GREENHOUSE EFFECT & GLOBAL WARMING

- **Greenhouse** is a small glass house used for growing plants during winter. The glass panel lets the light in, but does not allow heat to escape. Thus the greenhouse warms up.



- **Greenhouse effect** is a natural phenomenon that causes heating of Earth's surface and atmosphere. It maintains the present average temperature (**15°C**).
- Without greenhouse effect, the average temperature at Earth surface would have been at **-18°C**.
- Clouds & gases reflect 1/4th of the incoming solar radiation and absorb some of it. But half of it falls on Earth's surface heating it, while a small amount is reflected back. Earth's surface re-emits heat as **infrared radiation** (long wave). But

a part of it is absorbed by atmospheric gases (CO₂, CH₄ etc.) and so cannot escape into space. These gases (**greenhouse gases**) radiate heat energy. It comes to Earth's surface, heating it up again. It causes the greenhouse effect.

- Overheating of Earth due to increased level of greenhouse Gases, is called **global warming**.
- During the past century, the temperature of Earth has increased by 0.6°C, most of it during the last 3 decades.
- Contribution of greenhouse gases to total global warming: CO₂ (60%), CH₄ (20%), CFCs (14%) & N₂O (6%).

Impacts of global warming:

- Climatic changes (e.g. El Nino effect).
- Melting of polar ice caps, Himalayan snow caps etc.
- **Future impact:** Rise in sea level submerging coastal areas.

Control of global warming:

- Reduce the use of fossil fuel.
- Improve efficiency of energy usage.
- Reduce deforestation and plant trees.
- Slowing down the growth of human population.
- International initiatives to reduce greenhouse gases.

OZONE DEPLETION IN THE STRATOSPHERE

- **'Bad' ozone** is formed in **troposphere** (lower atmosphere). It harms plants and animals.
- **'Good' ozone** is found in the **stratosphere**. It acts as a shield absorbing ultraviolet radiation from the sun.
- UV rays are highly injurious since they cause mutation.
- The thickness of the ozone (O₃) in a column of air from the ground to the top of the atmosphere is measured in terms of **Dobson units (DU)**.
- In stratosphere, UV rays act on molecular oxygen (O₂) to produce ozone. UV rays also cause the degradation of ozone to O₂. These processes are balanced.
- But this balance is disrupted due to ozone degradation by **chlorofluorocarbons (CFCs- used as refrigerant)**.
- CFCs move upward and reach stratosphere. UV rays act on them releasing Cl atoms. In presence of Cl (catalyst), ozone degrades to O₂. This causes ozone depletion. It has formed **Ozone hole** over the Antarctic region.
- UV radiation of wavelengths shorter than UV-B, are almost completely absorbed by Earth's atmosphere. But, UV-B causes DNA mutation. It causes aging of skin, damage to skin cells and skin cancers. A high dose of UV-B causes inflammation of cornea (**snow-blindness**), cataract etc. It permanently damages the cornea.
- The **Montreal Protocol**: An international treaty (Canada, 1987) to control emission of ozone depleting substances.

DEFORESTATION

- It is the conversion of forested areas to non-forested ones.
 - Almost 40% forests have been lost in the tropics, compared to only 1% in the temperate region.
 - **National Forest Policy (1988)** of India has recommended 33% forest cover for the plains and 67% for the hills. But we have only 19.4% of forest cover (it was about 30% at the beginning of 20th century).
- Reasons of deforestation:**
- Conversion of forest to agricultural land.
 - For timber, firewood, cattle ranching etc.
 - **Slash & burn agriculture (Jhum cultivation)** in the north-eastern states of India. In this, forest trees are cut down and burn the plant remains. The ash is used as a fertiliser and the land is used for farming or grazing. After cultivation, the area is left for several years for its recovery. In earlier days, enough time-gap was given for recovery. Overpopulation & repeated cultivation decreased the recovery phase, resulting in deforestation.
- Consequences of deforestation:**
- Atmospheric CO₂ is enhanced because trees that could hold a lot of carbon in their biomass are lost.
 - Loss of biodiversity due to habitat destruction.
 - Disturbs hydrologic cycle.
 - Soil erosion & Desertification.
- Reforestation:** The process of restoring a forest that once existed in the past. It may occur naturally in a deforested area. We can speed it up by planting trees.
- People's Participation in Conservation of Forests**
- 1. Bishnoi movement**
 - Government of India has instituted the **Amrita Devi Bishnoi Wildlife Protection Award** for individuals or communities from rural areas for extraordinary courage and dedication in protecting wildlife.
 - 2. Chipko Movement of Garhwal Himalayas**
 - In 1974, local women participated to protect trees from the axe of contractors by hugging them.
- Government of India in 1980s introduced the concept of **Joint Forest Management (JFM)** to work closely with the local communities for protecting and managing forests. In return for their services, the communities get benefit of forest products (fruits, gum, rubber, medicine, etc.).

WANT ALL CHAPTERS? [Click Here](#)

Visit: www.bankofbiology.com

[Bio Master YouTube channel](#)

For Exam Special Resources Click the Links below:

[👉 +2 PREVIOUS YEARS QUESTION PAPERS & ANSWERS](#)

[👉 +1 PREVIOUS YEARS QUESTION PAPERS & ANSWERS](#)

[👉 CHAPTER-WISE Q & A, ONLINE UNIT TESTS](#)

[👉 HSE \(+1, +2\) MODEL QP & ONLINE EXAM SERIES](#)

[👉 EXAM CAPSULE NOTES](#)

[👉 EXAM CAPSULE VIDEOS](#)